

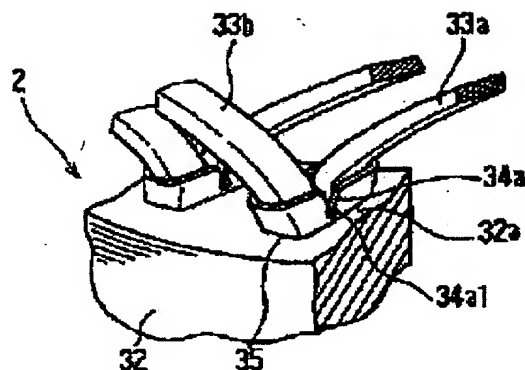
STATOR OF AC GENERATOR FOR VEHICLE

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Abstract of JP2001178057

PROBLEM TO BE SOLVED: To provide the stator of an AC generator for a vehicle adapted to constituting extension of a plurality of electrical conductors, extended from slots of a stator core toward both directions in the circumferential direction.

SOLUTION: An electrical insulating member 34 having slits 34a is disposed between electric conductors 33 and the inner walls of the slits 5 of the core 32 and is provided at the position corresponding to a boundary between a plurality of electrical conductors 33 contained in the slits 35. Thus, the member 34 is prevented from breaking.



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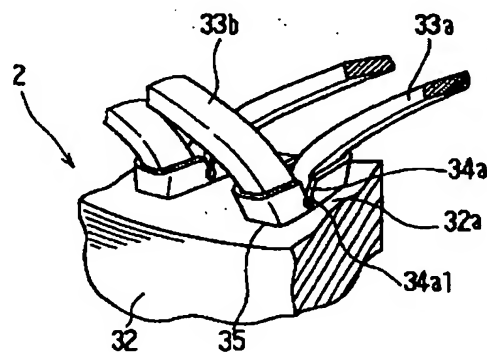
CC05 CC15 DB26 PB03

(54) 【発明の名称】 車両用交流発電機の固定子

(57) 【要約】

【課題】 固定子鉄心のスロットから延び出す複数の電気導体が周方向の両方向に向けて延び出している構成に適した車両用交流発電機の固定子を提供することにある。

【解決手段】 電気導体33と固定子鉄心32のスロット35の内壁面との間に介在して配置され、スロット35内に收容された複数の電気導体33の間の境界に対応した位置にスリット34aを有する電気絶縁部材34を備えるので、電気絶縁部材34が破れることが防止される。



【0010】本発明の請求項3によると、電気絶縁部材に重なり部を設けて閉塞部を形成するので、水や塩水の浸入防止と、電気導体の両方向への伸び出しとが両立できる。

【0011】本発明の請求項4および5によれば、スリットの端部形状は外部から受けるストレスに対して応力集中を緩和させる形状を有するので、電気絶縁部材が広がられるときに、スリットの末端が破れることを防止できる。なお、末端部の形状は例えば円形とすることが望ましい。

【0012】本発明の請求項6によると、複数の電気導体を接合して固定子巻線を形成することが容易にできる。

【0013】本発明の請求項7によると、スロット内における電気導体の断面形状をスロット形状に沿った略矩形形状にするので、スロット内の整列が可能となり、少ないスリット数で確実に電気絶縁部材の破れを防止できる。

【0014】

【発明の実施の形態】以下、本発明の車両用交流発電機の固定子に具体化した実施形態を図面に従って説明する。

【0015】（第1の実施形態）図1は、本発明の固定子が組付けられた車両用交流発電機の全体構造を示す断面図である。図1に示すように、車両用交流発電機1は、固定子2、回転子3、フレーム4、整流器5等を含んで構成されている。

【0016】固定子2は、固定子鉄心32と、固定子巻線を構成する複数の電気導体（以下、導体セグメントと呼ぶ）33と、絶縁層としてのシート状の電気絶縁部材（以下、インシュレータと呼ぶ）34とを備えている。固定子鉄心32は、薄い鋼板シートを重ね合わせて円筒状に形成されており、その内周面には多数のスロット35が形成されている。また、この固定子鉄心32から露出している導体セグメント33によって固定子巻線のコイルエンド31が形成されている。固定子2の詳細構造については後述する。

【0017】回転子3は、プーリ20が固定されたシャフト6と、このシャフト6に固定されたランデル型の鉄心7と、絶縁処理された銅線を円筒状かつ同心状に巻き回した界磁コイル8とを有する。界磁コイル8は、鉄心7を構成する一対のポールコア7aによって両側から挟み込まれている。また、鉄心7のフロント側の端面には、フロント側から吸い込んだ冷却風を軸方向および径方向に吹き出すために軸流式の冷却ファン11が溶接等によって取り付けられている。同様に、鉄心7のリア側の端面には、リア側から吸い込んだ冷却風を径方向に吹き出すために遠心式の冷却ファン12が溶接等によって取り付けられている。

【0018】フレーム4は、固定子2および回転子3を

収容しており、回転子3がシャフト6とともに回転可能な状態で支持されていると共に、回転子3の鉄心7の外周側に所定の隙間を介して固定子2が固定されている。また、フレーム4は、固定子2のコイルエンド31の径方向外側に冷却風の吐出孔42を有し、軸方向端面に吸入孔41を有する。

【0019】上述した構造を有する車両用交流発電機1は、ベルト等を介してプーリ20にエンジン（図示せず）からの回転力が伝えられると回転子3が所定方向に回転する。この状態で回転子3の界磁コイル8に外部から励磁電圧を印加することにより、鉄心7のそれぞれの爪部が励磁され、固定子巻線に3相交流電圧を発生させることができ、整流器5の出力端子からは所定の直流電流が取り出される。

【0020】次に、本発明の実施形態である固定子2の詳細について以下説明する。図2は、固定子巻線を構成する導体セグメント33の斜視図であり、固定子鉄心32に組付ける前の状態が示されている。図2に示すように、導体セグメント33は、棒状あるいは板状の金属材料（例えば銅）をターン部33cで折り曲げたほぼU字状に形成されており、ターン部33cよりスロット35の内周側に配置される内層側導体部33aと、ターン部33cよりスロット35の外周側に配置される外層側導体部33bとを含んで構成されている。また、これらの内層側導体部33aと外層側導体部33bのそれぞれは、固定子2のスロット35収容される直線部としての内部導体と、スロット35の外部に露出する外部導体とによって構成されている。

【0021】図3は、固定子2の部分的な平面図である。図3に示すように、固定子巻線を構成する各導体セグメント33は、固定子鉄心32の軸方向側面の一方にターン部33cが、他方にターン部33cと反対側の端部33dが配置されている。また、各導体セグメント33は、ターン部33cによって形成されるコイルエンド31とは反対側に位置する端部33dを互いに反対の周方向に折り曲げた後、異層の他の導体セグメント33の端部33d同士が接合されて結線される。固定子2の一方のコイルエンド31を構成する導体セグメント33の斜行部33eは、外層と内層とで逆方向に傾斜しており、各層内では同一方向に傾斜している。また、各導体セグメント33の端部33d同士の結線は、超音波溶着、アーク溶接、ろう付け等の電氣的接合による場合の他に、かしめなどの機械的加工手段を用いてもよい。

【0022】図4は、固定子2の部分的な径方向断面である。固定子2の固定子巻線は、固定子鉄心32の各スロット35に2本の導体セグメント33を挿入し、異なるスロット35に挿入された導体セグメント33の端部33d同士を互いに結線することにより構成されている。図4に示すように、この導体セグメント33の内層側導体部33aおよび外層側導体部33bのそれぞれの

【図9】第2の実施形態とのインシュレータの詳細形状を示す分解斜視図である。

【符号の説明】

1 車両用交流発電機

2 固定子

3 回転子

4 フレーム

32 固定子鉄心

32a 固定子鉄心の周方向端部

33 電気導体（導体セグメント）

33d 端部

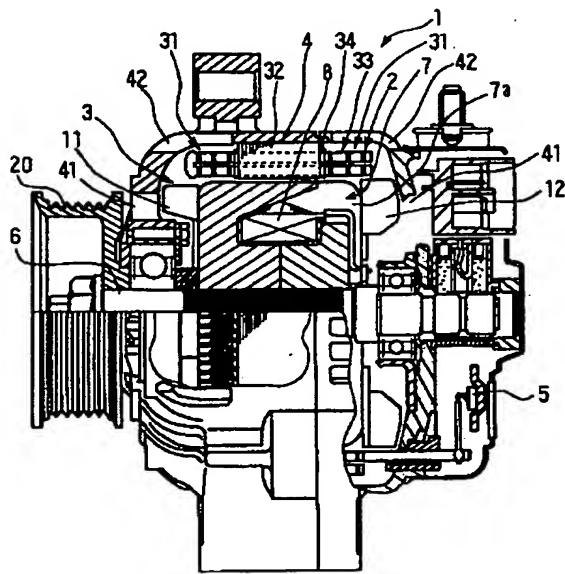
34、134、340 電気絶縁部材（インシュレータ）

34a、134a、340a スリット

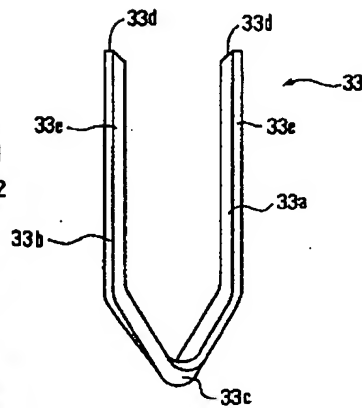
34a1、134a1、340a1、端部形状（スリットの終端）

35 スロット

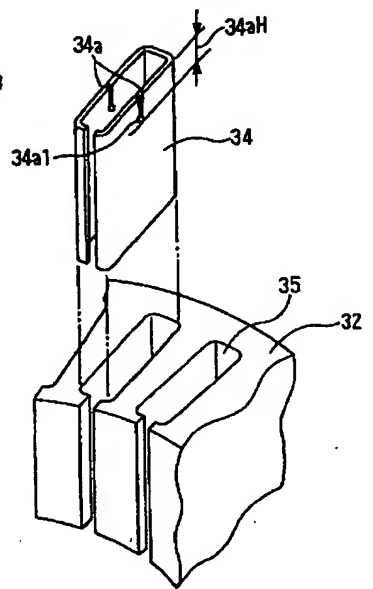
【図1】



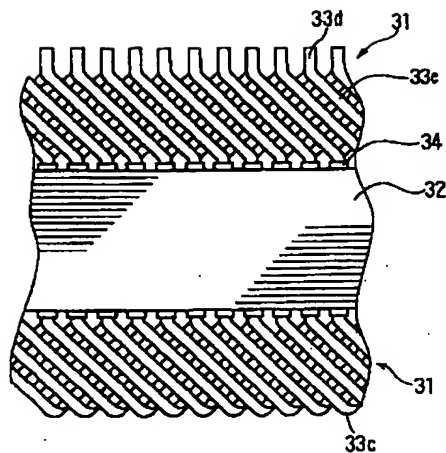
【図2】



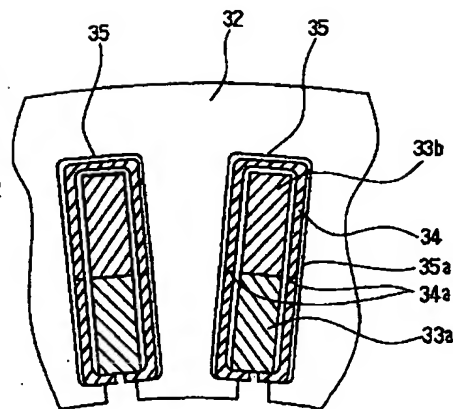
【図6】



【図3】



【図4】



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CLAIMS

[Claim(s)]

[Claim 1] The stator of the AC generator for cars characterized by to equip the location corresponding to the boundary between said electric conductors which intervened between said electric conductors and internal surfaces of said slot, have been arranged in the stator of the AC generator for cars equipped with the stator core which has two or more slots, and the stator winding constituted with the electric conductor held in said slot, and were held in said slot with the electric insulation member which has a slit.

[Claim 2] The stator of the AC generator for cars characterized by intervening between said electric conductors and internal surfaces of said slot, being arranged in the stator of the AC generator for cars equipped with the stator core which has two or more slots, and the stator winding constituted with the electric conductor held in said slot, and equipping the location corresponding to the direction edge of a path of said slot with the electric insulation member which has a slit.

[Claim 3] Said electric insulation member is the stator of the AC generator for written cars to claim 2 characterized by lapping with the location corresponding to one side of the direction edge of a path of said slot, and equipping the section and the location corresponding to another side with said slit.

[Claim 4] Said slit is the stator of claim 1 characterized by carrying out termination with the end shape which it is formed [end shape] covering predetermined die length in accordance with shaft orientations, and makes stress concentration ease from the shaft-orientations edge of said electric insulation member thru/or the AC generator for cars according to claim 3.

[Claim 5] The stator of the AC generator for cars according to claim 4 with which said end shape is characterized by being a circle configuration.

[Claim 6] Said stator winding is the stator of the AC generator for cars given in any 1 term of claim 1 to claim 5 characterized by joining said two or more electric conductors, and being formed.

[Claim 7] The stator of the AC generator for cars given in any 1 term of claim 1 to claim 6 characterized by the cross-section configuration of said electric conductor within said slot being an abbreviation rectangle configuration where the configuration of said slot was met.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates especially to the stator about the AC generator for cars carried in a passenger car, a truck, etc.

[0002]

[Description of the Prior Art] About the discontinuous construction between the stator cores and stator windings in the stator of the AC generator for cars, what is indicated by Denso public presentation technical report No.43-127 (September 15, 1985 issue) is known. According to Denso public presentation technical report No.43-127, in the stator of the AC generator for cars, many slits are prepared in the edge of the paper insulation (it is called an insulator below) which is the electric insulation member prepared between the core which is a stator core, and the stator coil which is a stator winding.

[0003]

[Problem(s) to be Solved by the Invention] As for the stator of the AC generator for cars of structure, many stator coils (it is hereafter called an electric conductor) are conventionally wound around the core (it is hereafter called a stator core) by the demand of small high power. However, the consideration corresponding to one 1 electric conductor is not made only by putting in a slit. Therefore, it is inadequate in order to prevent the tear of the insulator (it is hereafter called an electric insulation member) when passing by anchoring at the ends through between the slots prepared in the stator core with an electric conductor, even if it is any of a short pitch winding or a full pitch winding.

[0004] Furthermore, densification of the inside of an engine room is carried out from a viewpoint of the improvement in car amenity, the demand of the habitation space expansion in a car is increasing, and a small high increase in power is demanded of the AC generator for cars compared with the former. For this reason, structure compatible with high power and a miniaturization in the cooling engine performance is desired also about the stator which is also an exoergic member, and in order to draw the electric conductor passing-over technique which leads to the improvement in a degree of freedom of the coil optimum design of a stator coil, a prevention technique of the electric short circuit by the tear of the electric insulation member generated at the time of a coil is desired.

[0005] This invention is made in consideration of such a situation, and the purpose is in offering the stator of the AC generator for cars with which two or more electric conductors which begin to be prolonged from the slot of a stator core fitted the configuration which is beginning to be prolonged towards the both directions of a hoop direction.

[0006] Still more nearly another purpose of this invention is to offer the stator of the AC generator for cars which can prevent the tear of an electric insulation member to few slits, although two or more electric conductors which begin to be prolonged from the slot of a stator core are passed by anchoring at the ends through.

[0007]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the stator of the desired AC generator for cars is offered by adopting the technical means of a publication as any 1 term at least among claim 1 to claims 7.

[0008] Without tearing an electric insulation member, since a technical means to equip the location corresponding to the boundary between the electric conductors which intervened between the electric conductor and the internal surface of the slot of a stator core, have been arranged, and were held in the slot with the electric insulation member which has a slit is used according to claim 1 of this invention, an electric conductor is turned to the both directions of a hoop direction, and can be made prolonged [begin] aslant.

[0009] Since according to claim 2 of this invention it intervenes between an electric conductor and the internal surface of the slot of a stator core, and is arranged and a technical means to have the electric insulation member which has a slit is used for the location corresponding to the direction edge of a path of a slot, it becomes possible to bend the electric

conductor which begins to be prolonged from a slot in both directions, and the tear of an electric insulation member can be prevented with the small number of slits.

[0010] since according to claim 3 of this invention it laps with an electric insulation member, the section is prepared and the lock out section is formed -- permeation prevention of water and salt water and the both directions of an electric conductor -- it begins to extend and can be compatible in **.

[0011] Since the end shape of a slit has the configuration which makes stress concentration ease to the stress received from the exterior according to claims 4 and 5 of this invention, when an electric insulation member can extend, it can prevent that the termination of a slit is torn. In addition, as for the configuration of a trailer, it is desirable to suppose that it is circular, for example.

[0012] According to claim 6 of this invention, it can perform easily joining two or more electric conductors and forming a stator winding.

[0013] Since the cross-section configuration of the electric conductor within a slot is made into the abbreviation rectangle configuration where the slot configuration was met according to claim 7 of this invention, the alignment within a slot is attained and the tear of an electric insulation member can be certainly prevented with the small number of slits.

[0014]

[Embodiment of the Invention] Hereafter, the operation gestalt materialized to the stator of the AC generator for cars of this invention is explained according to a drawing.

[0015] (1st operation gestalt) Drawing 1 is the sectional view showing the whole AC-generator structure for cars where the stator of this invention was attached. As shown in drawing 1, AC generator 1 for cars is constituted including the stator 2, the rotator 3, the frame 4, and the rectifier 5 grade.

[0016] the stator 2 is equipped with a stator core 32, two or more electric conductors (the following and a conductor -- it is called a segment) 33 which constitute a stator winding, and the electric insulation member (it is hereafter called an insulator) 34 of the shape of a sheet as an insulating layer. A stator core 32 piles up a thin steel plate sheet, and is formed in the shape of a cylinder, and many slots 35 are formed in the inner skin. moreover, the conductor exposed from this stator core 32 -- the coil of a stator winding and 31 are formed of the segment 33. About the detail structure of a stator 2, it mentions later.

[0017] A rotator 3 has cylindrical and the field coil 8 rolled about in the shape of a said alignment for the shaft 6 to which the pulley 20 was fixed, the iron core 7 of the Landel mold fixed to this shaft 6, and the copper wire by which insulating processing was carried out. The field coil 8 is put by field-core 7a of the pair which constitutes an iron core 7 from both sides. Moreover, in order to breathe out the cooling wind absorbed from the front-side in shaft orientations and the direction of a path, the axial flow-type cooling fan 11 is attached in the end face of the front-side of an iron core 7 by welding etc. Similarly, since the cooling wind absorbed from the rear side is blown off in the direction of a path, the cooling fan 12 of a centrifugal type is attached in the end face of the rear side of an iron core 7 by welding etc.

[0018] While the frame 4 has held the stator 2 and the rotator 3 and the rotator 3 is supported in the pivotable condition with the shaft 6, the stator 2 is being fixed to the periphery side of the iron core 7 of a rotator 3 through the predetermined clearance. Moreover, a frame 4 has the discharge opening 42 of the cooling style on the coil of a stator 2, and the direction outside of a path of 31, and has the inhalation hole 41 in a shaft-orientations end face.

[0019] If the turning effort from an engine (not shown) is told to a pulley 20 through a belt etc., a rotator 3 will rotate AC generator 1 for cars which has the structure mentioned above in the predetermined direction. By impressing energizing voltage to the field coil 8 of a rotator 3 from the exterior in this condition, each claw part of an iron core 7 is excited, a stator winding can be made to generate three-phase-circuit alternating voltage, and a predetermined direct current is taken out from the output terminal of a rectifier 5.

[0020] Next, the detail of the stator 2 which is the operation gestalt of this invention is explained below. the conductor with which drawing 2 constitutes a stator winding -- it is the perspective view of a segment 33 and the condition before attaching to a stator core 32 is shown. it is shown in drawing 2 -- as -- a conductor -- the inner layer side which is formed in the shape of [which bent the metallic material (for example, copper) cylindrical / a segment 33 / or tabular by turn section 33c] about U characters, and is arranged from turn section 33c at the inner circumference side of a slot 35 - a conductor -- a section 33a side and the outer layer side arranged from turn section 33c at the periphery side of a slot 35 -- a conductor -- it is constituted including section 33b. moreover, these inner layer side -- a conductor -- a section 33a side and an outer layer side -- a conductor -- each of 33b is constituted by the inner conductor as a bay with which a stator 2 is held slot 35, and the outer conductor exposed to the exterior of a slot 35.

[0021] Drawing 3 is the partial top view of a stator 2. a stator winding is constituted as shown in drawing 3 -- each -- a conductor -- turn section 33c is arranged at one side of the shaft-orientations side face of a stator core 32, and, as for the

segment 33, 33d of edges of turn section 33c and the opposite side is arranged on another side. moreover -- each -- a conductor -- other conductors of the different layer after a segment 33 bends 33d of edges of each other located in the opposite side in the coil formed of turn section 33c, and 31 to an opposite hoop direction -- connection of the 33d of the edges of a segment 33 is joined and carried out. the conductor which constitutes one coil of a stator 2, and 31 -- skew section 33e of a segment 33 inclines to hard flow by the outer layer and the inner layer, and inclines in the same direction within each class. moreover -- each -- a conductor -- mechanical processing means else [in the case of being based on electric junction of ultrasonic welding, arc welding, soldering, etc.], such as a caulking, may be used for the connection of 33d of edges of a segment 33.

[0022] Drawing 4 is the partial direction cross section of a path of a stator 2. the stator winding of a stator 2 -- each slot 35 of a stator core 32 -- two conductors -- the conductor which inserted the segment 33 and was inserted in a different slot 35 -- it is constituted by connecting 33d of edges of a segment 33 mutually. it is shown in drawing 4 -- as -- this conductor -- the inner layer side of a segment 33 -- a conductor -- a section 33a side and an outer layer side -- a conductor -- each cross-section configuration of section 33b has the long rectangle in the direction of a path rather than the hoop direction, and the long side of this rectangle is arranged along the direction of a path. this conductor -- the conductor with which the insulating coat is formed on that front face, and a segment 33 adjoins -- the insulation of segment 33 comrades is performed by the insulating coat formed in each front face. moreover, a conductor -- the electric insulation between a segment 33 and the internal surface of a slot 35 is performed by the insulator 34. The insulator 34 is formed in tubed like drawing 6, locates opening prolonged in accordance with shaft orientations inside [direction of path] a slot 35, and is inserted in accordance with shaft orientations into a slot 35.

[0023] furthermore, an insulator 34 is shown in drawing 6 from drawing 4 -- as -- a conductor -- it has only two extending [in accordance with shaft orientations]-from the shaft-orientations edge by the side of 33d of edges of segment 33 slit 34a. two conductors located in a slot 35 -- it is arranged so that it may correspond to the boundary between Sections 33a and 33b. a conductor -- after being inserted into the slot 35 of a stator core 32, a segment 33 bends 33d side of edges which are beginning to extend from a slot 35, and is processed. since an insulator 34 has slit 34a at this time -- a conductor -- it is easy to deform along the bending direction of a segment 33.

[0024] Furthermore, the die length of slit 34a is die-length 34aH which does not reach even end-face 32a of a stator core 32 from the shaft-orientations edge of an insulator 34. The end shape 34a1 of the termination of slit 34a is equipped with the configuration which eases stress concentration. In addition, the end shape 34a1 is a circle configuration like drawing 5 and the drawing 6 illustration. In addition, the configuration which picked the Rth page in the angle of a rectangle configuration is sufficient as an end shape 34a1.

[0025] According to this operation gestalt, the tear of an electric insulation member can be prevented. And it can also be prevented that a tear is prolonged from a slit. Consequently, the electric short circuit accompanying the tear of an electric insulation member can be prevented.

[0026] Since the location of a slit was made to correspond to the boundary of an electric conductor and was prepared especially, the stator of the AC generator for cars with which the electric conductor which begins to be prolonged from the slot of a stator core fitted the configuration which is beginning to be aslant prolonged towards the both directions of a hoop direction can be offered.

[0027] In addition, the operation gestalt illustrated by drawing 7 and drawing 8 may be adopted. With drawing 7 and the operation gestalt of drawing 8, the number of electric conductors within a slot 35 is made into four. an insulator 134 -- lap section 134c -- having -- four conductors -- corresponding to the boundary between segments 133, it has a total of six slit 134a.

[0028] Moreover, a slit may be prepared in the edge by the side of an insulator 34 or turn section 33c of 134. Furthermore, a slit may be prepared in the both-ends edge of the shaft orientations of an insulator. Moreover, also when adding processing which extends the edge in the shape of a trumpet after a slit equips a stator core 32 with an insulator 34, 134, it is effective in order to prevent the tear of an insulator.

[0029] (2nd operation gestalt) The structure of the 2nd operation gestalt is explained with reference to drawing 9.

Drawing 9 is the perspective view showing the detail configuration of the insulator 340 of the stator 2 of the AC generator for cars used as the operation gestalt of this invention. Only the location and the number of a difference and others which arrange slit 340a are the same as that of the structure of the 1st operation gestalt.

[0030] The insulator 340 has only one slit 340a of predetermined length in the location corresponding to one side of the direction edge of a path of a slot 35. In the direction outside edge of a path which is another side of the direction edge of a path, lap section 340c of an insulator 340 is arranged. the conductor which begins to be prolonged from the slot 35 of a stator core 32 -- even when a segment 33 is bent in the both directions of a hoop direction, it laps with one slit 340a, and can prevent that an insulator 340 is torn by section 340c. In addition, slit 340a has predetermined length 340aH which

does not reach even the end face of a stator core 32, and an end shape 340a1 is a round shape-like. Predetermined length 340aH is smaller than variant-part 340b die-length 340bH by bending processing.

[0031] Furthermore, a slit may be prepared in above-mentioned lap section 340c. Moreover, on the other hand, the direction edge of a path of an insulator with opening 340 as shown in drawing 6 may come out, and the same slit as slit 340a may be prepared in a certain direction outside edge of a path.

[0032] With this operation gestalt, only by preparing at least one slit, even if the electric conductor which begins to be prolonged from the slot of a stator core is bent in the both directions of a hoop direction, the stator of the AC generator for cars which can prevent the tear of an electric insulation member can be offered.

[0033] In addition, the AC generator for cars is used in many cases under the severe environment where it is exposed to the electrolytic solutions, such as salt water and a car shampoo. For this reason, if it laps with an insulator and the section is prepared, it can have the lock out section and permeation of a foreign matter can be prevented.

[Translation done.]

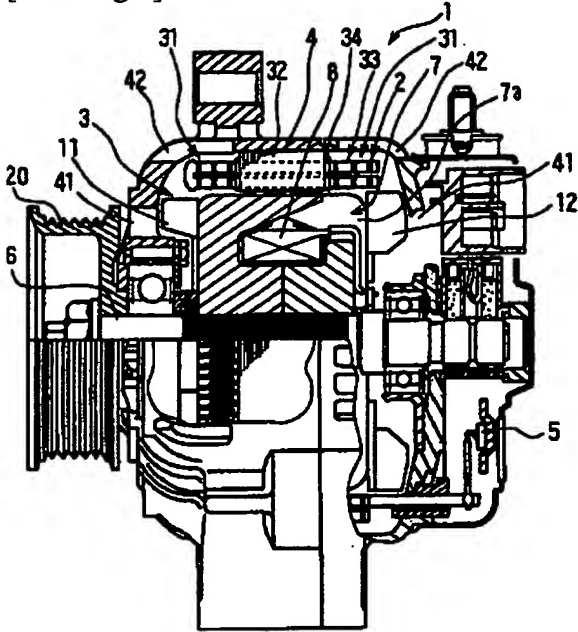
* NOTICES *

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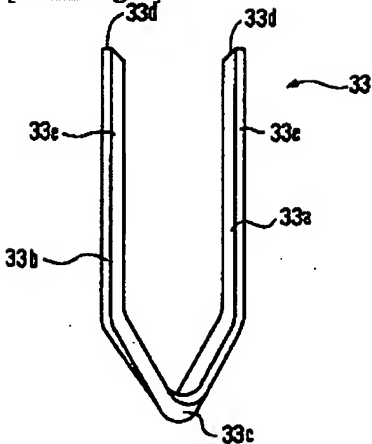
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

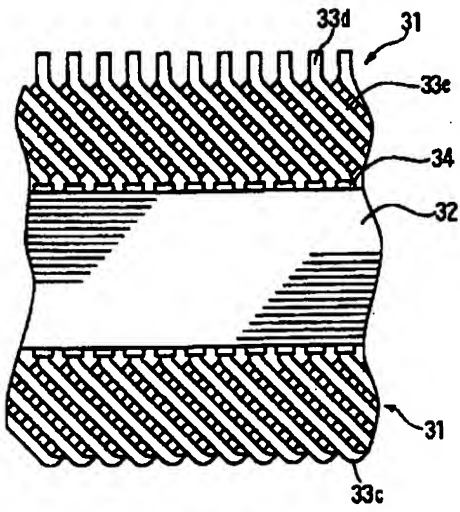
[Drawing 1]



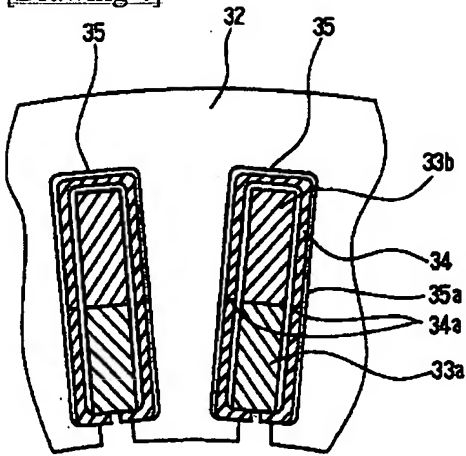
[Drawing 2]



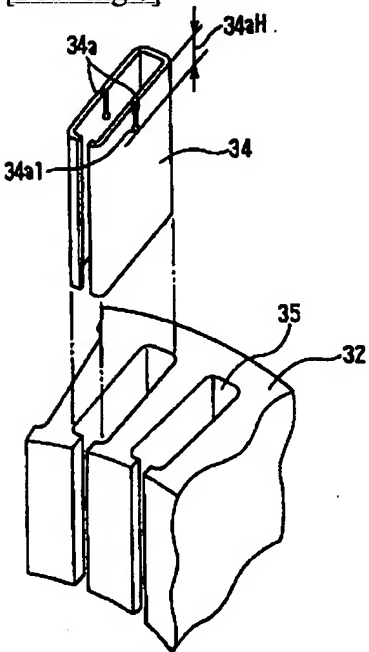
[Drawing 3]



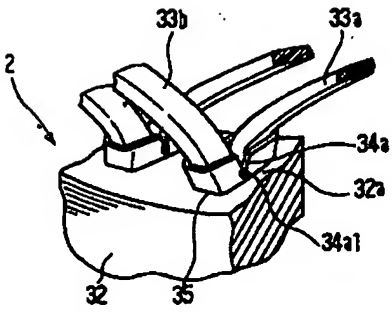
[Drawing 4]



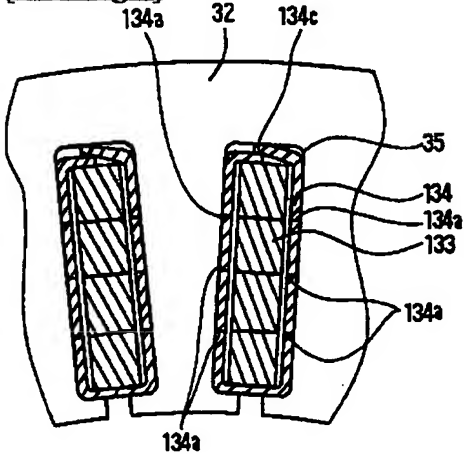
[Drawing 6]



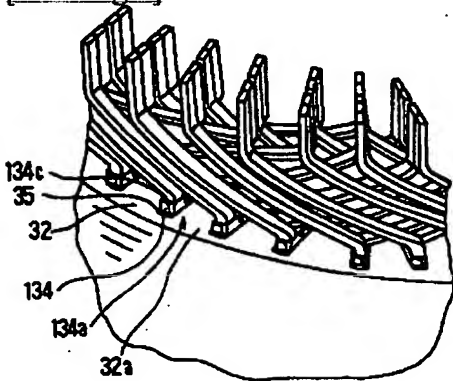
[Drawing 5]



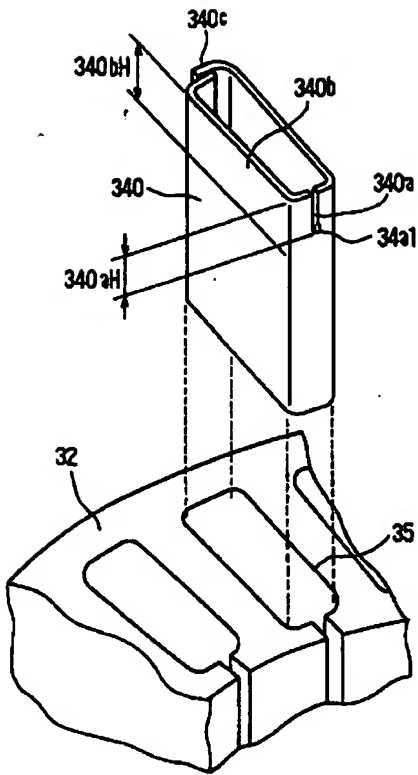
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]